> even if effective competition as defined by the Cable Act is not achieved.[186]

The Commission has previously endorsed this view as well:

> The market power of a cable operator can be diluted by two categories of entities: those currently offering comparable programming and those that could commence offering comparable programming within a relatively short period of time. ... [E]ven the potential for competition can have a constraining effect on the conduct of incumbents.[187]

Since the Commission's annual review of the status of video competition required by 47 U.S.C. § 548(g) includes an analysis of national DBS penetration, the Commission already has a ready vehicle for applying this sunset approach.

E. The Commission Should Adopt Certain Clarifications to Its Rules to Minimize Unauthorized Reception of Service.

GI fully supports the Commission's commitment to refrain from taking any action which could "inadvertently validate the manufacture and distribution of equipment intended for the unauthorized reception of communications services."[188] Toward this end, GI proposes that the Commission adopt the following rules to further clarify restrictions on theft of communications services:

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[186] Leland L. Johnson, Toward Competition in Cable Television 154-55 (MIT Press 1994) (emphasis in original).

[187] In the Matter of Waiver of the Commission's Rules Regulating Rates for Cable Services As Applied to Cable Systems Operating in Dover Township, Ocean City, New Jersey, 11 F.C.C.R. 1179, at ¶ 17 and n.38 (1995) (citing United States v. Marine Bancorporation, Inc., 418 U.S. 602, 623-25 (1974)).

[188] Notice at ¶ 33.

- A rule which makes it illegal to modify or tamper with serial numbers and related identifiers used as part of MVPD security systems (a similar rule is applied in the cellular context. See 47 C.F.R. § 22.919).

- A rule amending 47 C.F.R. § 2.1043 ("Changes in Certificated Equipment") by adding a new subsection that prohibits changes in converters that allow the devices to be used for theft of service.

- A rule which prohibits the grant of an equipment authorization to any device that can descramble programming in addressable systems without being controlled by the MVPD.

- A rule comparable in spirit (but not in detail) to 47 C.F.R. § 68.314 that prohibits the spoofing of billing systems in two-way MVPD systems.

F. Proprietary Technologies

1. The Issue of Compulsory Licensing is Not Germane to This Proceeding.

As an initial matter, GI believes that the issue of compulsory licensing is not germane to this proceeding. As discussed above in Section III, Section 629 focuses on creating alternative sources of distribution to the MVPD in providing equipment to consumers. While the compulsory licensing of other manufacturers may be sought by some under the guise of facilitating or increasing commercial availability, it is not necessary to implement congressional intent under Section 629. Stated another way, there is no "conflict between the 'commercial availability' objectives of Section 629 and those policies in the law that seek to 'promote the progress of Science and useful Arts' by securing exclusive rights to inventors

and authors."[189] Accordingly, the Commission need not and should not address the issue of compulsory licensing in this proceeding. However, in the event the Commission does address this issue, GI presents its views in the sections below.

2. There is No Need and No Jurisdictional Basis for the Commission to Compel Licensing of Proprietary Technology.

a. Voluntary Licensing is Already Occurring.

Even assuming arguendo that licensing of proprietary technology were required to satisfy Section 629's commercial availability standard, such licensing is already occurring voluntarily, and thus there is no need for Commission action.

For example, GI has licensed various aspects of its proprietary DigiCipher® II/MPEG-2 technology, including its access control technology, to other manufacturers, thereby enabling them to develop and market interoperable equipment for use in conjunction with satellite, cable, MMDS, and other networks.[190] Current DigiCipher® II/MPEG-2 system licensees include Hewlett-Packard Company, Zenith Electronics, and Pace Micro Technology. GI's DigiCipher® II/MPEG-2 licensing framework includes improvements made to the system (by GI or its licensees),

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[189] Notice.at ¶ 70 (citing U.S. Constitution, Article I, Section 8).

[190] Manufacturers may license either the full GI system or relevant sub-parts (such as the access control, forward error correction, or transmission subsystems).

so that all suppliers can remain interoperable over time. GI places no restrictions on its licensees with respect to the distribution of equipment through retail channels.[191]

Moreover, GI and Scientific Atlanta are currently working towards a licensing arrangement that would enable each other's digital consumer terminals and other digital residential equipment to be used in a dual conditional access system. This system would utilize GI's core encryption technology and allow each party to use their own access control system.

In some cases, GI is actively licensing proprietary technology on a royalty-free basis. For example, under its cable transmission license, GI provides a royalty-free license to GI patents relating to modulation, demodulation, and forward error correction of digital data.[192]

Similar licensing arrangements have emerged to provide alternative sources of equipment used in conjunction with small

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[191] GI also notes that in developing its DigiCipher® II/MPEG-2 system (which may be used in conjunction with digital cable and satellite services), GI has employed open standards (such as those specified by SCTE and ATSC) wherever possible, and has contributed to the development and broadening of open standards where appropriate and necessary. See Appendix C for a further discussion of GI's adoption of open standards.

[192] Of course, GI has every incentive to provide reasonable licensing terms. Otherwise, the wide deployment of our products by MVPDs will be jeopardized. This is especially true given the desire of network operators to reduce the capital costs incurred for navigation devices by encouraging customer ownership of such equipment.

dish DBS services such as Direct TV/USSB.[193] Moreover, owners of C-Band home satellite dishes are afforded access to alternative types of integrated receiver/decoders, as a result of privately-negotiated arrangements which involve the licensing of GI's proprietary VideoCipher® II technology.[194] Under these arrangements, various manufacturers were authorized to produce integrated receiver decoders. These integrated devices are then sold to home satellite users through various retail distribution outlets.

GI believes the foregoing developments demonstrate the ability of marketplace forces to ensure the availability of multiple sources of navigation devices without the imposition of an intrusive, unauthorized, Commission-mandated compulsory licensing system.[195] Accordingly, GI urges the Commission to conclude, as it

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193 See Notice at n.33.

194 Id. at ¶ 22.

195 See Besen and Gale at 39-40 (describing the two primary drivers of second sourcing: (1) buyer demand; and (2) a vendor's anticipation that its profits will increase because the second source will "expand the market"); See also Mark Robichaux, "Time Warner, Inc. is Expected to Buy New Set-Top Boxes," Wall Street Journal, December 10, 1996, at B10 (Time Warner purchased one million digital consumer terminals, 550,000 from Zenith and the remainder from Toshiba Corp. and Pioneer Electronic Corp., which Time Warner specified as alternative sources for the equipment).

did in its 1990 Satellite Encryption Report,[196] that the adoption of a compulsory licensing system is unnecessary and inappropriate.[197]

Finally, as explained below, any attempt to impose a compulsory license requirement would raise serious constitutional issues and would exceed the scope of the Commission's authority under the Communications Act, as amended.

b. The Commission Has No Authority to Impose a Compulsory Licensing System.

Congress has not granted the Commission authority to compel licensing of proprietary technology. Moreover, Section 629(f) explicitly states that "[n]othing in this section shall be construed as expanding or limiting any authority that the Commission may have under law in effect before the date of enactment of the Telecommunications Act of 1996."[198] Accordingly, the Commission may not rely on the provisions of Section 629 itself as authority to impose a system of compulsory licensing on owners of intellectual property which may be embodied in navigation

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[196] See Report, In the Matter of Inquiry Into the Need for a Universal Encryption Standard for Satellite Cable Programming, Report, 5 F.C.C.R. 2710, at ¶ 56 (1990).

[197] See also Besen and Gale at 38-39 ("Compulsory licensing is undesirable because . . . it may 'create impediments to technological development,' which is especially important where, as here, the potential for rapid technical change is so great" (citation omitted).

[198] 47 U.S.C. § 549(f).

devices used in conjunction with MVPD-provided services.[199] Any attempt by the Commission to impose mandatory licensing obligations of this nature would therefore constitute unauthorized regulation of legal rights granted to patent holders under the framework of laws established by Congress pursuant to Article I, Section 8 of the United States Constitution.[200] Any such attempt would also raise serious constitutional issues under the Fifth Amendment's "takings" clause.[201]

Article I, Section 8 of the Constitution grants Congress plenary authority over the nation's system of patents.[202] Under federal law, patents possess "the attributes of personal property."[203] The essence of property, of course, is the right to exclude others.[204] Nothing in the patent laws requires the patentee

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[199] Nor is such authority conferred in any other provision of the 1996 Act. Moreover, Section 601(c)(1) of the 1996 Act states unequivocally that "[t]his Act and the amendments made by this Act shall not be construed to modify, impair, or supersede Federal, State, or local law unless expressly so provided in such Act or amendments," thereby foreclosing any claim that the Act implicitly grants the Commission authority to restrict the legal rights of intellectual property owners.

[200] U.S. Constitution, Article I, § 8, cl.8.

[201] Id., Amendment V.

[202] 1 Peter D. Rosenberg, Patent Law Fundamentals § 1.03 (2d ed. 1996).

[203] 35 U.S.C. § 261.

[204] Patent Law Fundamentals § 1.03. As the Supreme Court has explained, "The heart of [a patentee's] legal monopoly is the right to invoke the State's power to prevent others from utilizing his

(continued ...)

to license anyone to manufacture or distribute products using the patent.[205] Congress has conferred such rights on patent holders as a spur to innovation and invention.[206] In order to preserve these incentives, compulsory licensing requirements have been permitted to constrain the rights of patent holders only in a relatively few, discrete areas.

In this regard, Congress has expressly authorized the federal government, under 28 U.S.C. § 1498, to exercise its power of eminent domain to take a compensable compulsory license in any U.S. patent,[207] and has provided patent holders with the opportunity to

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(... continued)

discovery without his consent." Zenith Radio Corp. v. Hazeltine Research, Inc., 395 U.S. 100, 135 (1969).

[205] Dawson Chem. Co. v. Rohm & Haas Co., 448 U.S. 176, 202, reh'g denied, 448 U.S. 917 (1980).

[206] The Commission acknowledges that the law creates and protects proprietary rights "as a means of promoting the advancement of science and rewarding enterprise." Notice at ¶ 70. Indeed, the Commission has always recognized the importance of protecting proprietary technologies in order to encourage innovation. See, e.g., Inquiry into the Scrambling of Satellite Television Signals and Access to Those Signals by Owners of Home Satellite Dish Antennas, Report, 2 F.C.C.R. 1669, at ¶ 44 (1987) ("It is settled in law and policy that patent holders are entitled to exploit their legal 'temporary monopoly' by charging royalties and are generally under no obligation to license their patents at all. This provides incentives for efficient, socially beneficial investment in new technology."); Encryption NOI, 4 F.C.C.R. 3479, at ¶ 56 ("[P]atents are ... granted to provide incentives for investment in the development of new technology").

[207] See Decca Ltd. v. United States, 209 U.S.P.Q. 52, 59 (Ct. Cl. 1980), cert. denied, 454 U.S. 819 (1981); Leesona Corp. v. United States, 599 F.2d 958, 968 (Ct. Cl.), cert. denied, 444 U.S. 991 (Ct. Cl. 1979).

seek money damages in the Claims Court if their patent "is used or manufactured by or for the United States without license."[208] Aside from authorizing the appropriation of patented technology for the government's own use, Congress has conferred on only one or two federal agencies the authority, in certain narrowly circumscribed circumstances, to compel licensing of patents in "well-defined fields of technology that are affected with a substantial and overriding public interest."[209] The Atomic Energy Act empowers the Nuclear Regulatory Commission to license private persons to use patented inventions involving the production or use of special nuclear material or atomic energy.[210] In so doing, however, the Act narrowly limits the class of potential licensees, provides explicit statutory criteria that the agency must satisfy before it can compel licensing, and expressly establishes a remedial scheme to compensate affected patent holders.[211]

The Clean Air Act confers an even more limited authority on the Administrator of the Environmental Protection Agency to effect compulsory licensing of patented technology necessary to ensure compliance with pollution standards.[212]

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208 See 28 U.S.C. § 1498.

209 Patent Law Fundamentals § 12.04[4].

210 See 42 U.S.C. § 2183.

211 Id.

212 See 42 U.S.C. § 7608. Under the Clean Air Act, the EPA Administrator may request that the Attorney General seek a court
(continued ...)

Although Congress has been urged on numerous occasions to revise the patent system to reduce the rights of patent holders, it has consistently rejected such suggestions and has instead strengthened the protections afforded. For example, in 1988, Congress amended the patent laws to specifically provide that a refusal to license or use any rights to a patent does not constitute patent misuse or an illegal extension of patent rights.[213]

Indeed, even where a patent holder has misused its proprietary technology in violation of the antitrust laws, the courts have been reluctant to override constitutionally sanctioned patent rights by compelling dedication or royalty-free licensing of such rights as a form of antitrust relief. In this regard, the Supreme Court, in Hartford-Empire Co. v. United States, cautioned:

> That a patent is property, protected against appropriation both by individuals and by government, has long been settled. In recognition of this quality of a patent the courts, in enjoining violations of the Sherman Act arising from the use of patent licenses,

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(... continued)

order compelling a patent holder to license a particular invention. The Attorney General must make certain statutorily-prescribed findings before even seeking such an order, i.e., that use of the patent is not otherwise reasonably available and is necessary for compliance with various air pollution limitations, that there are no other reasonable alternatives to accomplish compliance, and that the unavailability of the patent may result in a substantial lessening of competition or tendency to create monopoly in a line of commerce. Ultimately the determination of whether mandatory licensing is proper, and if so, on what terms, is left to the court. Id.

213 See 35 U.S.C. § 271(d)(4).

> agreements, and leases, have abstained from action which amounted to a forfeiture of the patents.[214]

Similarly, in United States v. National Lead Co., the Supreme Court declined to mandate royalty-free licensing, and supplied the following rationale for its reluctance to interfere with patent rights:

> The attempt of the Government to throw the field of technical knowledge ... wide-open would reduce the competitive value of the independent research of the parties. It would discourage rather than encourage competitive research. It would be contrary to, rather than in conformity with, the policy of the patent laws now in force. Changes in the underlying policies of the patent laws frequently have been presented to Congress, but Congress, by its failure to accept those changes, has added to, rather than detracted from, the strength of the present and traditional patent policies.[215]

While mandatory licensing on a reasonable-royalty basis is a well-established form of antitrust relief,[216] such requirements are imposed only after a judicial determination that the patent holder has engaged in illegal activities. In such cases, leading commentators have urged that the use of compulsory licensing as a remedy for antitrust violations should be carefully circumscribed.[217]

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[214] Hartford-Empire Co. v. United States, 323 U.S. 386, 415 (1945) (citations omitted), clarified 324 U.S. 570 (1945).

[215] United States v. National Lead Co., 332 U.S. 319, 359 (1947) (citation omitted).

[216] See, e.g., United States v. Glaxo Group Ltd., 410 U.S. 52, 59, 64 (1973).

[217] See e.g., Philip E. Areeda and Herbert Hovenkamp, Antitrust Law, vol. 3 (rev. ed. 1996) at 158 ("[C]ompulsory licensing may be

(continued ...)

In short, Congress has adopted a comprehensive framework addressing all aspects of the patent system, which confers broad rights on patent holders in order to encourage innovation and investment in the development of new technology. To ensure that these benefits are preserved, Congress and the courts have imposed only the most narrow, carefully balanced limitations on those rights, in order to protect against anti-competitive abuse, safeguard the nation's air quality, maintain the nation's supply of critical nuclear materials, and permit the government itself to use patented technology to promote public health and safety. Moreover, in each instance in which Congress has constrained the otherwise broad rights of patent holders, it has specifically prescribed an avenue of redress that, in all but one case, entails a judicial determination of the reasonable royalty.[218] In the face of Congress' all-encompassing patent scheme, it is simply inconceivable that the Commission has implicit authority to undertake -- without any congressional guidance whatsoever -- that

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(... continued)

the only remedy for some antitrust violations involving patents, but even then it must be used sparingly."). See also F.M. Scherer, Industrial Market Structure and Economic Performance (2d ed. 1980), at 457 (observing that the use of compulsory licensing may be appropriate to the extent it is "judiciously confined to cases in which patent-based monopoly power has been abused or extended far beyond levels needed to provide adequate incentive. . . .").

[218] The one exception is Section 2183 of the Atomic Energy Act. In this instance, in lieu of a judicial determination, Congress prescribed the criteria that the NRC must consider when deciding upon a reasonable royalty. See 42 U.S.C. § 2187.

which Congress has expressly permitted only one or two federal agencies to do in only the most limited of circumstances.

However, even assuming arguendo that the Commission has authority to impose a compulsory licensing system on GI and other patent holders, such action is clearly unwarranted and inappropriate in this instance. First, the Commission would have to confront and resolve the difficult constitutional issues raised by the imposition of a compulsory licensing system that effectively results in a regulatory "taking" of the patent holder's intellectual property. Any attempt to address such concerns through compensation paid to the patent holder in the form of royalty payments inevitably would lead to disputes concerning the appropriate level of such payments. The administrative costs of resolving such disputes are likely to be substantial. As one court in a recent patent infringement case acknowledged, "the valuation of a royalty payment is very difficult."[219] Yet another court has observed:

> Determination of a "reasonable royalty" ... like many devices in the law, rests on a legal fiction. Created in an effort to "compensate" when profits are not provable, the "reasonable royalty" device conjures a "willing" licensor and licensee, who like Ghosts of Christmas Past, are dimly seen as "negotiating" a "license."[220]

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[219] Sands, Taylor & Wood v. Quaker Oats Co., 34 F.3d 1340, 1351 (7th Cir. 1994).

[220] Panduit Corp v. Stahlin Bros., 575 F.2d 1152, 1159 (6th Cir. 1978).

Indeed, the Commission itself has acknowledged that the imposition and enforcement of regulatory requirements relating to the licensing of intellectual property "would require us to adjudicate disputes over which we have little expertise and, arguably, to intrude on functions performed by other agencies and the courts."[221]

Moreover, even if these constitutional concerns and related administrative challenges were successfully resolved, there remains considerable doubt that significant economic benefits would accrue from Commission-mandated compulsory licensing. Competitive benefits resulting from such licensing may not be passed on to the consumer in the form of lower prices or better quality. The experience with compulsory licensing statutes in other countries has yielded inconclusive results as to net public benefits.[222]

Finally, as shown above, the market-driven licensing policies adopted by GI and others already assure that there are alternative suppliers for navigation devices used in conjunction with existing

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[221] In the Matter of Amendment to the Commission's Regulatory Policies Governing Domestic Fixed Satellites and Separate International Satellite Systems, Report and Order, 11 F.C.C.R. 2429, at ¶ 28 (1996).

[222] For references to the controversial Canadian experience in compulsory pharmaceutical patent licensing statutes, see, e.g., McCrae, Tapon, Gorecki and Hartle, "Compulsory Licensing of Drug Patents, Three Comments," 10 Canadian Public Policy 34 (1984).

MVPD services.[223] GI strongly believes that the continued operation of marketplace forces, coupled with a flexible, performance and incentive-based regulatory approach such as that proposed by GI, will yield the requisite commercial availability for these and other devices which fall within the scope of Section 629. Accordingly, GI urges the Commission to adopt this market-based approach in lieu of an unauthorized, constitutionally-suspect compulsory license regime.

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[223] Also as noted above, GI places no restrictions on its licensees with respect to the distribution of licensed technology through retail channels.

CONCLUSION

Based on the foregoing, GI respectfully urges the Commission to: (1) adopt a flexible regulatory model, such as the "PRIME" approach, to implement the commercial availability provision of the 1996 Act; (2) phase in its regulations over time; (3) refrain from applying these rules to analog navigation devices and network equipment such as residential gateways, as well as to those MVPDs whose navigation devices already satisfy the commercially available standard; (4) avoid any compulsory licensing of proprietary technologies; and (5) pursue an approach in the areas of portability/interoperability, subsidy/bundling, waiver, sunset, and consumer right to attach consistent with the comments herein.

Respectfully submitted,

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May 16, 1997

APPENDIX A

An Economic Analysis of the Commercial Availability of "Navigation Devices" Used in Multichannel Video Programming Systems

Stanley M. Besen and John M. Gale

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May 16, 1997

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I. Executive Summary

Section 629 of the Communications Act requires the Federal Communications Commission (Commission) to

> adopt regulations to assure the commercial availability, to consumers...of...equipment...used to access multichannel video programming and other services offered over multichannel video programming systems, from manufacturers, retailers, and other vendors not affiliated with any multichannel video programming distributor.[1]

As a result of the regulations to be adopted by the Commission under this provision, many of the external or auxiliary devices currently provided by Multichannel Video Programming Distributors (MVPDs) may become available through retail outlets, including outlets from which consumers typically purchase their electronic entertainment equipment. Congress, however, has not mandated that all of the equipment currently offered to subscribers by MVPDs be immediately made available through retail establishments, nor has Congress required that this type of equipment be offered only through these establishments. Moreover, Congress has not imposed specific requirements on the process through which retail availability is to be encouraged, leaving that to the Commission. As a result, the following questions remain to be addressed by the Commission in this or subsequent proceedings:

- What restrictions should be placed on the types of equipment that can be offered at retail?
- What requirements should be imposed on MVPDs to ensure retail availability?

[1] 47 U.S.C. Sec. 549 (a).

- What restrictions, if any, should be placed on the prices charged by MVPDs for equipment that is also offered at retail?

- What should be the respective roles of the Commission and of private standards organizations in the process for promoting retail availability?

This paper provides an economic analysis of these issues. It reaches six broad conclusions. First, the Commission should not require that equipment needed to provide MVPD system security be provided at retail. Decisions about the manner in which such equipment is provided should remain with the MVPD operator who alone has the incentives to promote efficient security. That may mean that security devices will continue to be made available only through operators, although technological developments may permit other means for distributing security equipment, including possibly through independent retailers.

Second, ensuring retail availability may require MVPDs and MVPD system equipment manufacturers to provide information about the technical characteristics of both cable networks and security equipment to other manufacturers so that they can design equipment that can connect to, and interact with, equipment provided by the operator. In addition, to the extent commercial availability is achieved via a separation of security and non-security components, it may be necessary to require operators to make available separate security devices to those consumers who wish to obtain additional equipment through retail establishments.

Third, operators should be given considerable latitude in pricing new equipment. Because there may be important network externalities, so that the value of new equipment may depend on the number of consumers who adopt such equipment, it may be necessary initially to set low prices to encourage purchases by early adopters. This provides benefits not only to later adopters,

by permitting the growth of the networks to which they become attached, but also to independent manufacturers and retailers who experience an increase in demand if early adoptions create a critical mass of consumers.

Fourth, because technology in MVPD systems is changing so rapidly, it is important that the government not adopt regulations that impede such developments. For this reason, the government should continue to rely on the private standard-setting process to develop the technical requirements needed to bring about the widespread retail availability of consumer MVPD equipment.

Fifth, compulsory licensing of the intellectual property of equipment manufacturers is neither necessary nor desirable. Much industry-led licensing activity is already occurring, and compulsory licensing is likely to impede innovation.

Finally, because competition among MVPD systems constrains consumer equipment prices in the same manner as competition among equipment suppliers to a single system, the Commission should sunset the commercial availability rules for any MVPD system that faces effective competition.

II. There Will be a Continuing Need for Set-Top Boxes

The development of television standards in the United States began in 1940 with the formation of the National Television Systems Committee (NTSC), which had been established under the auspices of the Radio Manufacturers Association (RMA).[2] Standards for monochromatic television were recommended by the NTSC to the Commission and adopted by the Commission in the following year.

[2] For a somewhat more detailed discussion of the development of U.S. television standards, see S.M. Besen and L.L. Johnson, *Compatibility Standards, Competition, and Innovation in the Broadcasting Industry*, RAND Corporation, R-3453-NSF, November 1986, Chapter VII.

The process of adopting color television standards began in 1949 with a petition to the Commission from CBS to permit it to broadcast commercially in color. Four years later, the Commission approved a color standard that had been proposed by the NTSC using a technology that had been developed by RCA and modified with the cooperation of a number of other receiver manufacturers, including Philco, Hazeltine, Sylvania, General Electric, and Motorola. These standards, which are compatible with the monochromatic standards, are still in use.

The tuning range of television receivers was standardized after the passage of the All Channel Receiver Act of 1962.[3] The Act, which was intended to promote the development of UHF broadcasting, mandated that all television receivers manufactured or sold in the United States be capable of receiving all channels, including all UHF channels, for which television broadcast licenses could be obtained. In 1970, the Commission adopted rules requiring that all receivers have comparable tuning for VHF and UHF stations. This had the effect of standardizing "click-tuning" for UHF stations.

Although television receivers are now standardized to a significant degree, new features in receivers continue to be developed and marketed. Among those that have recently been introduced are on-screen displays, stereophonic sound, timer and sleep functions, and built-in videocassette recorders. The result is a wide array of product offerings that, nonetheless, share common features and are compatible with the existing television system.

While the pace of introduction of new features in television receivers is rapid, the turnover of the installed base of receivers is slow. Television

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[3] The overall benefits to consumers of the Act are questioned in D.W. Webbink, "The Impact of UHF Promotion: The All-Channel Television Receiver Law," *Law and Contemporary Problems*, 34, 535-561, 1969.

receivers are held for 15 years on average,[4] in part because picture tubes, which represent a very large proportion of the cost of receivers, have a long life. As a result, the capabilities of receivers in current use vary widely. Importantly, not all receivers currently in use can provide the full range of offerings of cable systems and other MVPDs. This has led to two developments.

First, cable operators and other MVPDs have adopted set-top boxes as a method of offering new services to consumers for whom the purchase of new receivers to receive these services is uneconomical. For example, cable set-top boxes permit subscribers who do not have new receivers, or have new receivers that cannot receive all the services offered by their cable operators, to obtain these services without having to replace their current receivers. Similarly, subscribers to Direct Broadcast Satellite (DBS) services must obtain additional equipment to receive satellite transmissions.

It is also important to observe that not all "set-top boxes" have been provided by cable operators or other MVPDs. Videocassette recorders permit viewers to play pre-recorded movies and to record and replay broadcast or cable programs on receivers without those capabilities.[5] Although receivers with built-in VCRs have recently appeared on the market, viewers who wish to record or replay television programs but do not wish to replace their receivers can purchase stand-alone VCRs.[6] As another example, Soundview Technologies will soon offer set-top boxes that are V-chip converters to permit viewers to employ V-chip technology with their existing receivers.[7]

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[4] Reported in *Cablevision*, October 21, 1996, p. 28, and attributed to Dr. John Ball.
[5] Some consumers with older receivers may use VCRs to tune a wider range of channels and for a more useful remote control.
[6] Of course, most consumers continue to purchase stand-alone VCRs despite the availability of integrated receiver-VCRs.
[7] *Communications Daily*, January 14, 1997, p. 6.

Moreover, the use of set-top boxes is not limited to subscribers to cable systems or other MVPDs. Chairman Hundt has referred to the possibility that some viewers of over-the-air television may choose to employ such boxes to receive digital broadcast television signals rather than replace their existing receivers when analog transmissions cease.[8]

The second development is that, over time, many services that were initially available only through the use of devices external to television receivers have come to be offered through the receivers themselves. Examples of features that became widely accepted and used, and subsequently migrated to television receivers, are tuners capable of receiving the full range of cable television transmissions and stereo television sound.

The earliest uses of set-top boxes were to enable viewers to receive the entire range of frequencies transmitted by their cable systems, which was often difficult or impossible with the receivers then in use.[9] Over time, however, as the proportion of viewers who subscribed to cable increased, manufacturers found it profitable to offer receivers that could perform this function. Today, virtually all sets being sold have this feature. As a result, set-top boxes are not currently needed by subscribers who have new receivers and wish to receive only basic cable programming, although that could change if the channel capacity of cable systems and the number of basic services offered increases substantially beyond current levels.[10] At that point, these subscribers would have the choice of purchasing new receivers capable of receiving the larger

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[8] "In the future you could purchase a box that would let you watch digital channels on today's TV, so the TV, itself, is not going to become defunct or non-operational. You might just have to buy a box to continue to use it." Transcript of *The Newshour with Jim Lehrer*, April 3, 1997, p. 8.

[9] For example, early set-top boxes were used by owners of VHF-only receivers to tune UHF channels. General Instrument introduced its first electro-mechanical cable converter to deliver 20 channels in 1967 (Presentation by Carol Armitage to WICT panel, March 25, 1997).

[10] For many cable systems, increasing channel capacity can be effected most economically through conversion from analog to digital transmission, so that all subscribers who do not own digital receivers will require set-top boxes.